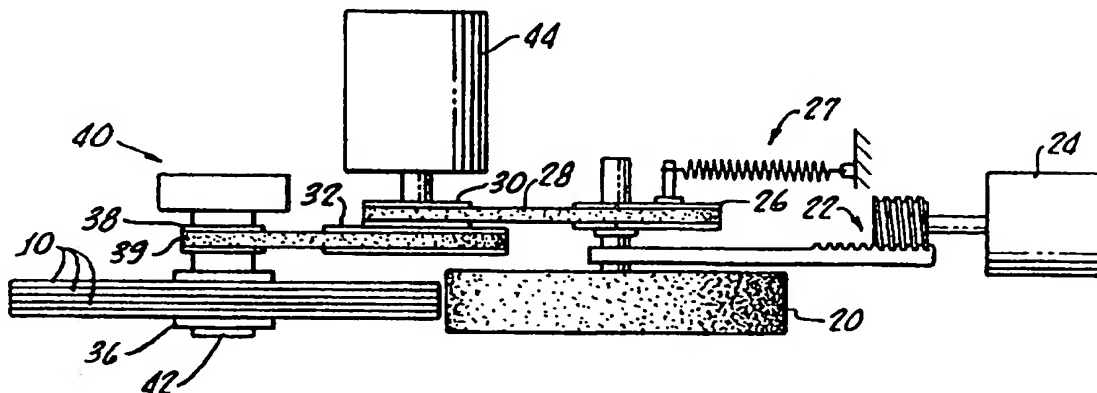




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(54) Title: COMPACT DISC DESTROYER



(57) Abstract

The present invention provides a device and method for destroying CDs (10). One embodiment of the apparatus consists of grinding wheel (20) composed of a plurality of small blades or stacked grinding wheels and cylinder (42) for mounting CDs (10). Clip (36) holds the CDs (10) on the cylinder (42). Cylinder (42) is attached to bearing (40). Pulley (38) is attached to cylinder (42) and receives drive belt (39) which is driven by motor (44). Motor (44) is attached to pulley (30) which drives belt (28). Belt (28) is looped around movable pulley (26) which is attached to brace (29). Spring (27) maintains tension on pulley (26) and also the belt (28) when the grinding wheel (20) is shifted towards the CDs (10) to be destroyed.

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COMPACT DISC DESTROYER

Background of the Invention

Compact discs (CDs) are ubiquitous in society. They are used to store information of all types including, but not limited to software, government information, music, interactive media, movies, etc. The advantage of their use is the massive amounts of information which can be stored on a relatively small surface. Various types of CDs are available including Digital Audio (CD-A), Read Only Memory (CD-ROM), CD-ROM Extended Architecture (CD-X/A), Interactive (CD-I), Video (CD-V), Recordable (CD-R), and Erasable (CD-E). The present invention is directed to destroying any of the various types of CDs provided above such that information previously stored on the CD is irretrievable.

CDs are manufactured with strict tolerances in order to be consistently and reliably read by compact disc readers. CDs used to store computer programs, music or other information, unlike those used store feature length motion pictures, have a diameter of 120 mm, a data area with a radius of 33 mm, a lead out (1 mm radius) and lead in area (2 mm radius) located on either side of the data area, a 16 mm radius clamping area and a 15 mm diameter center hole. The disc is comprised of a protective layer, a plastic substrate and a reflective coating, consisting of gold, aluminum or silver, located between the plastic substrate and the protective layer. In addition, such CDs generally contain a printed label which is located on the opposite side of the protective layer.

Information on a CD is stored on an information bearing surface (IBS). This is located on the plastic substrate and comprises a spiral track of pits surrounded by unaltered disc areas called lands or flats. Pits are microscopic indentations in the plastic substrate that represent the digital data recorded there. Pits are about 0.11 micrometers deep and 0.5 micrometers wide, and their length varies from 0.8 to 3 micrometers. The pits have a depth of 0.1 micrometer, which is critical for the proper reflection of light.

The pits on the CD are arranged in tracks, which such tracks are separated by as little as 1.6 micrometers. Indeed, a human hair would cover up to about 60 turns of a spiral track on a CD.

The prior art teaches destroying the information bearing layer be either burning the entire CD or exposing the CD to chemicals which would dissolve the plastic substrate and thereby the pattern of pits contained therein. The prior art does not provide a mechanical device which destroys all of the pits on the IBS. Indeed, a CD they do not want to be disseminated to the public and scratch the IBS in a straight line from the clamping area to the outer edge so a standard compact disc reader cannot retrieve the information. However, there are other sophisticated readers which can retrieve information from such a disc. The prior art further

does not provide a device for adequately destroying a CD, or its IBS, within the confines of a normal work environment.

CDs destroyed via burning or chemical must be done so at sites which are generally not located where the user of the is. Destruction, therefore, requires that the CDs be shipped to a location where such destruction can be adequately, safely and economically accomplished. The shipping costs, the time needed to properly ship and receive the CDs increases the expense of their destruction. For government confidential information, this type of handling increases the costs of documenting the custodial care of such CDs.

A new method of adequately destroying CDs, or just the IBS, which does so in an inexpensive, earth-friendly manner is needed. More particularly, a device for destroying CDs, or the IBS, within the confines of the normal work environment is needed. The present invention solves these problems.

Summary of the Invention

It is a primary object of the present invention to provide a device which will destroy at least the data area of a CD or remove the IBS such that previously recorded information is irretrievable.

Another object of the present invention is to provide a device to destroy CDs within the confines of the normal office environment. It is a further object of the present invention that the device be earth-friendly.

The present invention provides a device useful for the destruction of CDs in an efficient, environmentally-friendly manner. The CD destroyer comprises a disc presentation means and a blade, the blade juxtaposed with respect to the disc such that the CD is optimally positioned with respect to the blade. The blade may be moved towards the stationary CD or CDs or the CD may be presented to a stationary, yet rotating, blade. The CD or CDs are then destroyed completely or at least the portion of the CD upon which the IBS is resident is obliterated.

The present invention provides a device useful for the destruction of the IBS of a CD in an efficient and environmentally-friendly manner. This CD destroyer comprises a disc presentation means and an IBS removal means. The CD is presented to the IBS removal means so the IBS may be removed and only a "ghost" of the original CD remains. Preferably, the IBS removal means is a rotating, wire encrusted device which removes the IBS, when the CD is presented, by scraping it away.

Additional objects, advantages and other novel features of the invention will be set forth in part in the description that follows as well as in the drawings provided herewith. Moreover, such objects and advantages will become apparent to those skilled in the art upon examination of the

following or may be learned with the practice of the invention. The objects and advantages of the invention ;may be realized and attained by means of devices and combinations particularly pointed out in the description.

Brief Description of the Drawings

- 5 The accompanying drawings incorporated in and forming a part of the specification, illustrate several aspects of the present invention, and together with the description, serve to explain the principles of the invention.

10 Drawing 1 provides overhead and side views of an embodiment of the present invention whereby one or more discs are, except for the plastic which surrounds the hole in the middle of the CD, are ground up or shredded. In this embodiment, the discs are fed to the grinder or shredder on an axis substantially parallel to the axis of rotation of the grinder or shredder.

Drawing 2 provides overhead and side views of an embodiment of the present invention whereby the discs are fed to a grinder or shredder at an axis substantially perpendicular to the axis of rotation of the grinder or shredder. In this embodiment, the entire disc is ground up.

- 15 Drawing 3 provides a side view of a device of the present invention whereby only the IBS is destroyed. It further provides a partial underside view of an IBS cutter used in the present invention. In this embodiment, only the IBS is removed. The disc is fed to the IBS cutter in a manner similar to that used to feed CDs to a CD player.

- 20 Drawing 4 provides a side view of a device of the present invention whereby only the IBS is destroyed. In this embodiment, the disc is fed to the IBS in a manner similar to that of Drawing 1, that is, by being positioned between two belts. After removal of the IBS, the "ghost" is transported to a waste area by the same manner.

Reference will now be made in detail to the present preferred embodiments of the invention, examples of which are illustrated in the accompanying drawings.

Detailed Description of the Invention

The present invention provides a mechanical device for destroying an information bearing surface of a compact disc, the device comprising means for disrupting substantially all of the information bearing surface of the compact disc; and means for presenting the compact disc to the information bearing surface disruption means in a manner which facilitates the destruction of the disc such the information contained on the disc is rendered irretrievable. In a preferred embodiment of the present invention, the means for disrupting the information bearing surface is a grinding wheel operated at RPMs suitable to grind up the information bearing surface of the compact disc. In another preferred embodiment of the present invention, the means for disrupting the information bearing surface is a blade operated at RPMs suitable to cut up the information bearing surface of the compact disc. In a further embodiment of the present invention, the means for disrupting the information bearing surface is a plurality of blades operated at RPMs suitable to cut up the information bearing surface of the compact disc.

In an embodiment of the present invention, the means for presenting the compact disc includes a cylinder over which one or more compact discs may be fitted, the cylinder positioned such that the grinding wheel can destroy the information bearing surface of the compact discs as it moves toward the cylinder and then withdraw to allow for loading the cylinder with additional compact discs to be destroyed.

In another embodiment of the present invention, wherein the means for disrupting substantially all of the information bearing surface of the compact disc includes a wire cutting wheel. Preferably, the means for presenting the compact disc includes one or more feed belts.

In another embodiment of the present invention, the means for presenting the compact disc is a receptacle designed to receive a compact disc. Preferably, the means for disrupting substantially all of the information bearing surface of the compact disc includes a wire cutting wheel.

The present invention provides a method for destroying the information bearing surface of a compact disc such that information contained on the disc is rendered irretrievable, the method comprising introducing a compact disc into the device provided in the present application.

For purposes of this invention, "information contained on the disc is rendered irretrievable" means that the single largest dimension of any particulate from the destroyed information bearing surface must not be larger than 0.25 mm.

Reference is made to Drawing 1 which provides a CD Destroyer of the present invention adapted for destroying batches of 1 or more CDs. The drawing provides an overhead view and a side view of a CD destroyer with a blade 20 whose axis of rotation is substantially parallel to

the CD 10 it destroys. Preferably, the blade 20 is a single grinding wheel. Alternatively, it can be composed of a plurality of small blades or grinding wheels stacked up upon each other.

The present invention further comprises a cylinder 42 on which one or more CDs 10 are slid thereon. A clip 36 keeps the CDs 10 from sliding off the cylinder 42. Preferably, the CDs 10 fit snugly over the cylinder 42, leaving little play therebetween so the CDs 10 cannot rotate. The cylinder 42 is attached to a bearing 40. A pulley 38 is also fixed to the cylinder 42 and positioned to receive a drive belt 39. The drive belt 39 is attached to a pulley 32 driven by a motor 44. Also attached to the motor 44 is a pulley 30 which drives a belt 28. Belt 28 is looped around an additional pulley 26 attached to a brace 29. This pulley is not fixed but is movable. A spring 27 maintains tension on the pulley and therefor the belt 28 when the blade 20 is shifted towards the CDs 10 to be destroyed.

The blade 20 is driven by the belt 28. Its cutting (or grinding) surface height is at least equal to the cumulative heights of the most CDs anticipated to be destroyed by the present invention. The blade 20 is attached to a boom 22. The boom 22 moves the blade 20 towards the cylinder 42 so the cutting surface of the blade 20 contacts, and thereby destroys, the CDs 10. The boom 22 is actuated by a servo motor 24. Preferably the boom 22 is grooved to provide precise movement toward the CDs 10 to be destroyed.

The device operates by switching on the motor 44. It turns both pulleys 30 and 32, with the pulley 32 being larger and thereby resulting in the CDs being turned at a slower speed than the grinder 20. The present invention provides spinning the CDs 10 to counteract the opposing spinning forces created when the CDs are ground by the blade 20. It also allows for the blade 20 to be effective at a lower RPM, thereby allowing for the use of a lower RPM motor and thereby making the device less expensive. The boom 22 is moved by the servo motor 24 such that the grinding surface of the blade 20 is applied to the CDs 10 with constant force. Preferably, the boom 22 moves toward the CD at a rate of from .01 mm to 1.5 mm per 1 revolution of the CD 10. More preferably, the boom moves toward the CD at a rate of 0.25 mm per 1 revolution of the CD 10. While the CDs 10 are being ground up and the servo motor 24 continues to move the boom 22 towards the cylinder 42, the pulley 26, in part attached to a spring 27, maintains tension on the belt 28 to insure continuous revolution of the blade 20. The distance the servo motor 24 moves the boom 22 can be preprogrammed to any size CD 10 placed on the cylinder 42. It is preferable to preprogram the servo motor so all but the clear polypropylene plastic which creates the center aperture of the CD 10 remains. Preferably, the residue is dust-like and preferably is smaller than 0.25 mm in dimension.

Reference is made to Drawing 2 which provides a CD destroyer of the present invention which is adapted for hand feeding CDs to the grinder. The embodiment is housed within a case 50 and comprises a blade 52 with a cutting surface substantially equivalent to the length of the feed

belt 54. The feed belt 54 need not be so large, but it is preferable to utilize as much of the cutting surface as possible.

The embodiment operates by inserting a CD between an operating feed plate belt top 56 and a feed plate bottom 58. As the side view provides, the space between the feed plate top 56 and feed plate bottom 58 is substantially equal, if not slightly smaller than, the height of the standard CD. The side to side length of the feed belt 54 need not be substantially equivalent to the length of the blade 52, yet in a preferred embodiment it is to allow for the destruction of larger-diameter CDs, such as those used for storing feature length motion pictures, and for facilitating the destruction of large numbers of CDs.

In operation, the feed plate 56 rotates in a counter-clockwise fashion and feed plate 58 rotates in a clockwise fashion at substantially the same speed. The CD is placed in the space therebetween, and the action of the feed plates 56 and 58 begin transporting the CD towards the blade 52. The blade 52 can comprise a plurality of standard saw blades stacked together and supported by an axis 55 which is further supported by two bearings 60. The blade 52 is powered by a motor 53. Motors envisioned for the present invention include motors presently utilized on table saws or high speed drills. The blade 52 is preferably rotated in a counterclockwise fashion at an RPM which cleanly shreds the CD as it is presented by the feed plates 56 and 58. In a preferred embodiment, the RPM is in the range of 4000-6000. More preferably, the RPM is 5280 RPM. The RPM should not be too high as it is not advantageous to melt the CD. Preferably, the residue is dust-like and preferably is smaller than 0.25 mm in dimension.

Reference is made to Drawing 3 which provides a CD destroyer of the present invention which is adapted for destroying only the IBS. The CD Destroyer is designed to remove the IBS and leave behind a "ghost," a polypropylene disc which can be recycled.

The CD Destroyer provided in Drawing 3 comprises a stage 72 which defines a depression 75 designed to receive a CD 10. The CD is fitted over the stud 73 and is locked into place by lock 74. The CD 10 is loaded into the depression 75 while the stage 72 is not positioned underneath the IBS cutting wheel 78. In the side view presented in Drawing 3, the stage 72 is loaded with a CD 10 and is positioned under the IBS cutting wheel 78. The stage 72 is rolled into position by virtue of rollers 80 spaced in a manner sufficient to facilitate the removal of the stage as well as support the stage while the IBS is being removed from the disc. The rollers 78 are preferably located inside a track to facilitate their movement.

In the present embodiment the stage 72 is rolled into place by hand, but the stage 72 can be retracted automatically, similar to the manner in which CDs are inserted into CD players.

Preferably, the stage 72 is produced by machining a single metal work piece to insure the

exactness of the size of the depression 75. It would be preferable if the stage contained perforations to facilitate the removal of debris generated by the destruction of the IBS.

Drawing 3 further provides an underside view of the IBS cutting wheel 78. It provides the cutting surface 76. Preferably, the surface consists of sturdy wire bristles. In another embodiment, it comprises a surface typically found on grinding wheels. In either case, the cutting surface must be configured so it can remove the entire IBS. Different diameter IBS cutting wheels 78 must be provided for the various diameters in which CDs 10 are produced. The wheel 78 must define an aperture 74 such that the cutting surface 76 does not interfere with the stud 73 and the lock 74 on the stage 72 when the CD 10 is positioned for destruction of the IBS.

This embodiment of the present invention operates by the motor 84 providing sufficient drive means to generate the RPM necessary to remove the IBS. RPMs in the range of 500-6000 are preferred. More preferably, RPMs in the range of 2000-5000 are preferred. The drive means is preferably a belt encased within the armature 79. The belt drives the pulley 81 to which is fixed the IBS cutting wheel 78, thereby rotating the IBS cutting wheel to the desired RPM. Once the stage 72 is in place, the armature can be lowered by hand or mechanically. Preferably, it is lowered via a servo motor which lowers the cutting surface 76 to a pre-determined location to insure the IBS is adequately removed. Prior to its destruction, the CD is loaded in a manner such that the IBS is directed away from the depression 75. As the IBS is being destroyed, a vacuum motor 82 is actuated to remove the dust-like particles created. The particles would be drawn into bag 86 for separate disposal or recycling. This embodiment of the present invention is particularly adapted to recovering particulate matter from a CD which uses gold or other precious metal as a reflecting surface.

Reference is made to Drawing 4 which provides a CD destroyer of the present invention which also is adapted for destroying only the IBS. The CD Destroyer is designed to remove the IBS and leave behind a "ghost," a polypropylene disc which can be recycled.

The present invention set forth in Drawing 4 provides a CD Destroyer in a case 90 and a wire wheel 92 adjustably connected to motor 94 which provides the rotating force of the wire wheel 92. The positioning of the wire wheel 92 must be flexible to account for wear of the wire bristles.

The present invention as provided in Drawing 4 further provides two dual sets of belts 102, 104 for presenting the CD to the wire wheel 92 and removing it therefrom. The top dual set of belts 102 comprises powered belt 106 and non-powered belt 108. The tension of the belt can be set by tension arm 110 to insure a tight fit of the CD when between the belts. For other embodiments of the present invention, the belts are both powered.

As the CD is presented to the wire wheel 92, the IBS is scrapped off by the rotating action of the wire bristles. In the present embodiment, there is a gap between belts 108 and 114 to prevent wear caused by the wire brush rotating in the CD aperture. In another embodiment of the present invention, the belts 108 and 114 are combined into one belt, either powered or not.

- 5 After the IBS of the CD is scrapped off, the ghost is presented to the bottom belts 112 and 114, which transports the ghost to the waste area. In this embodiment, belt 112 is powered and 114 is not. In addition, belt 114 tension is adjusted by belt tensioner 116, to insure that the ghost is not forced through the belts by the rotation forces of the wire wheel 92. For other embodiments of the present invention, the belts are both powered.
- 10 The foregoing description of preferred embodiments of the present invention have been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed. Obvious modifications or variations are possible in light of the above teachings. The embodiments were chosen and described to provide the best illustration of the principles of the invention and its practical application to
- 15 thereby enable one of ordinary skill in the art to utilize the invention in various embodiments and with various modifications as are suited to the particular use contemplated.

Claims

1. A mechanical device for destroying an information bearing surface of a compact disc, the device comprising:

means for disrupting substantially all of the information bearing surface of the compact disc; and

means for presenting the compact disc to the information bearing surface disruption means in a manner which facilitates the destruction of the disc such the information contained on the disc is rendered irretrievable.

2. The device of claim 1, wherein the means for disrupting the information bearing surface is a grinding wheel operated at RPMs suitable to grind up the information bearing surface of the compact disc.

3. The device of claim 1, wherein the means for disrupting the information bearing surface is a blade operated at RPMs suitable to cut up the information bearing surface of the compact disc.

4. The device of claim 1, wherein the means for disrupting the information bearing surface is a plurality of blades operated at RPMs suitable to cut up the information bearing surface of the compact disc.

5. The device of claim 2, wherein the means for presenting the compact disc includes a cylinder over which one or more compact discs may be fitted, the cylinder positioned such that the grinding wheel can destroy the information bearing surface of the compact discs as it moves toward the cylinder and then withdraw to allow for loading the cylinder with additional compact discs to be destroyed.

6. The device of claim 1, wherein the means for disrupting substantially all of the information bearing surface of the compact disc includes a wire cutting wheel.

7. The device of claims 1, 2 or 6, wherein the means for presenting the compact disc includes one or more feed belts.

8. The device of claim 1, wherein the means for presenting the compact disc is a receptacle designed to receive a compact disc.

9. The device of claim 8, wherein the means for disrupting substantially all of the information bearing surface of the compact disc includes a wire cutting wheel.

10. A method for destroying the information bearing surface of a compact disc such that information contained on the disc is rendered irretrievable, the method comprising introducing a compact disc into the device recited in claim 1.

FIG. 1a.

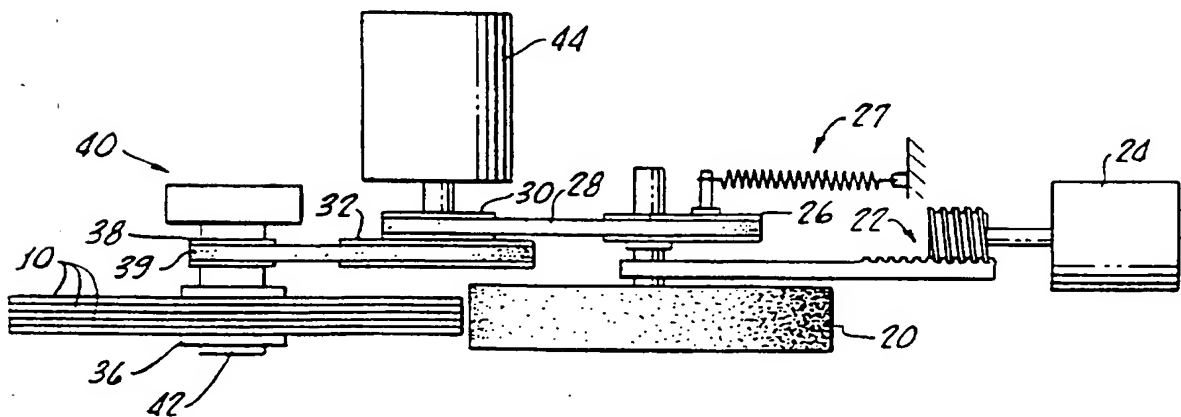
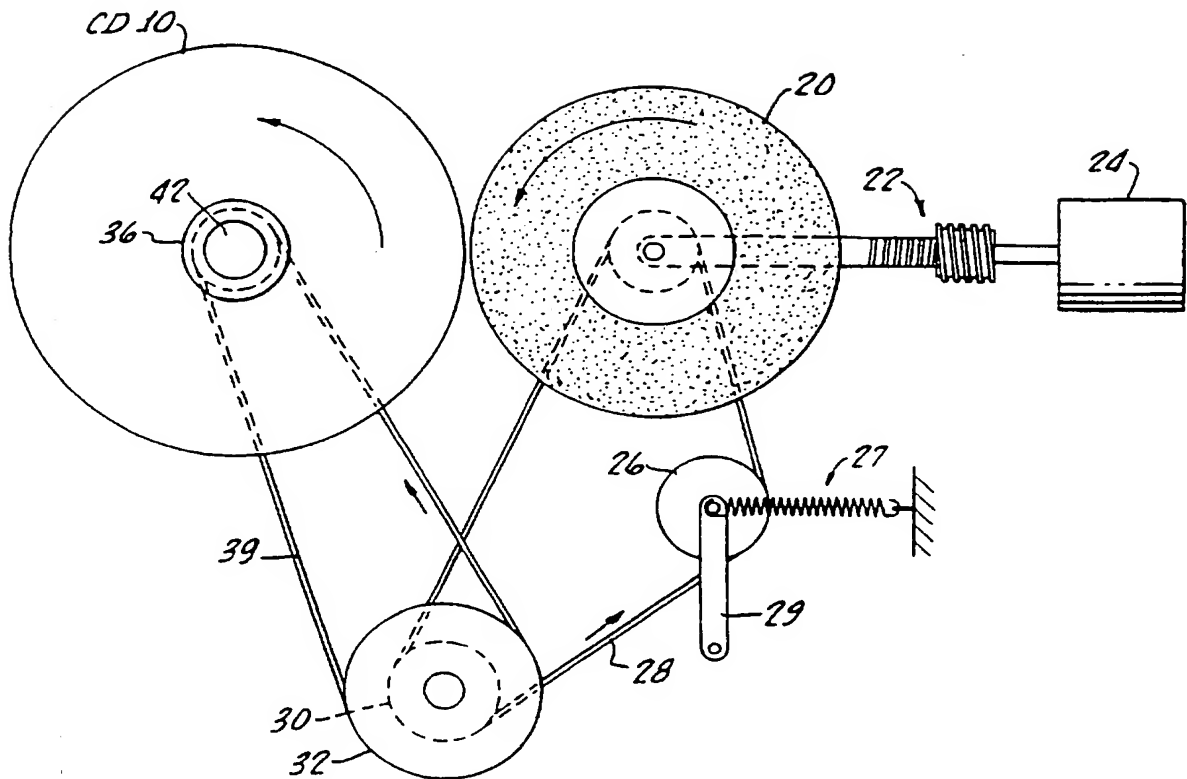


FIG. 1b.

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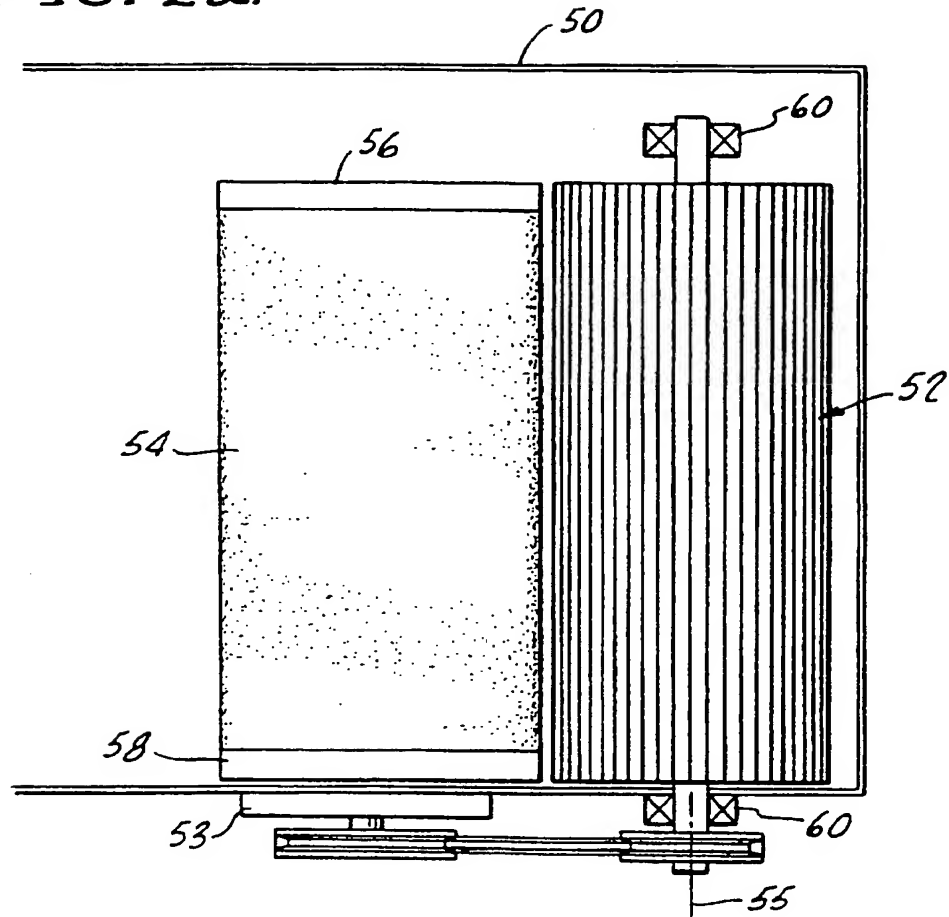
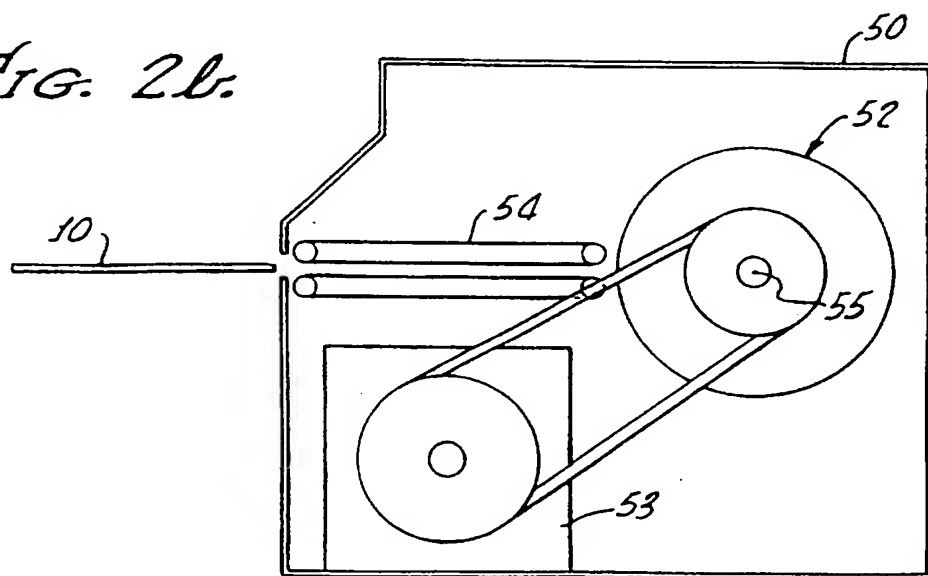
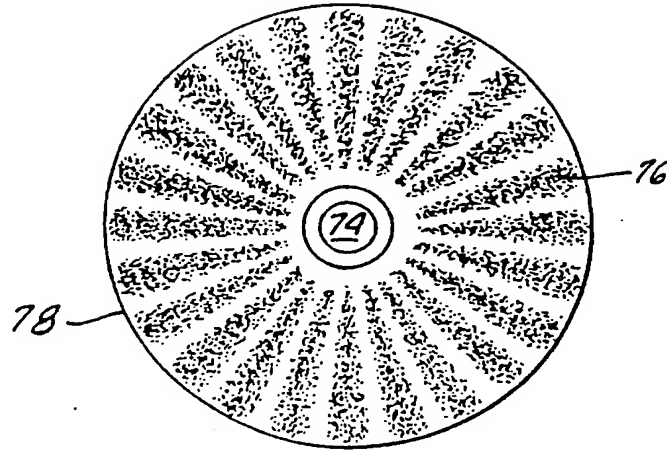
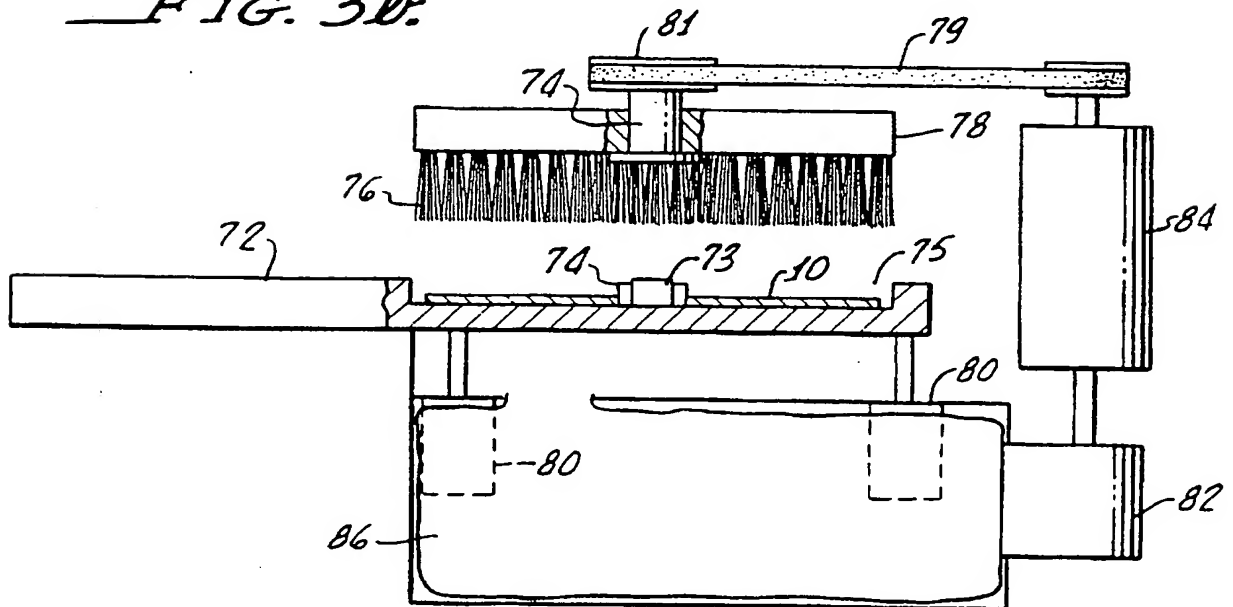
FIG. 2a.*FIG. 2b.*

Fig. 3a.Fig. 3b.

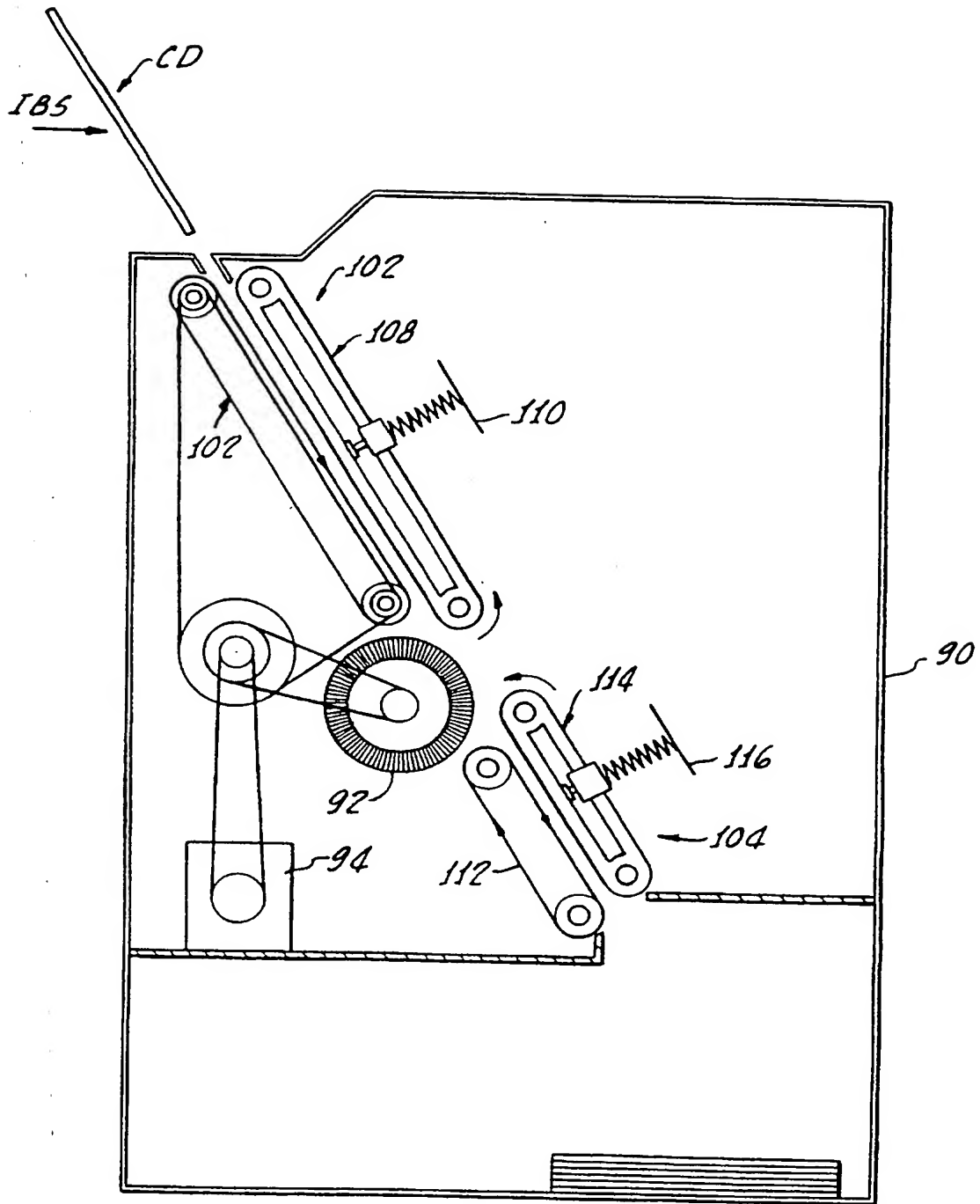


FIG. 4.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US97/01715

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) : B24B 1/00

US CL : 451/63

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 451/63, 178, 179, 182, 184, 236, 254, 258, 259, 260, 285, 287, 290, 490

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5,524,313 A (SATO) 11 June 1996	1,8,10
Y	US 4,654,917 A (YEUNG) 07 April 1987, see entire document, specifically figure 1	1,8,10
X	US 5,220,754 A (TAYEBI et al) 22 June 1993, see entire document, specifically figure 12	1,6,7,10 ----- 2,3,4,8,9
Y	US 5,593,343 A (BAUER) 14, January 1997, see entire document, specifically figure 4	1-4,6, and 8-10
X	US 5,203,067 A (DEFAZIO) 20 April 1993, see entire document, specifically figure 2	1,3,10 ----- 2,4,6



Further documents are listed in the continuation of Box C



See patent family annex.

* Special categories of cited documents	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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